

Anthelmintic Therapy Program in a School Using Two Formulations of Dithiazanine

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WITH the recent increase in migration of Puerto Ricans to the United States, many schools in some of the larger northern cities have large proportions of Puerto Rican students. In Philadelphia, where approximately 70 percent of these students have been found to have intestinal nematodes (1), consideration has been given to establishing a therapy program against these parasites.

Reports on the broad-spectrum effectiveness of dithiazanine have suggested that it might be suitable for anthelmintic mass therapy in a school program (2-15). The first effective drug against *Trichuris trichiura*, it has been shown also to be effective against *Enterobius vermicularis*, *Strongyloides stercoralis*, and *Ascaris lumbricoides*, and to a lesser degree against hookworm. Although side reactions have been reported, in most instances they have not interfered with the completion of therapy.

In the treatment of outpatients at the parasitosis clinic of the Philadelphia Health Department, it was found that a formulation of dithiazanine designated dithiazanine II, with the longest disintegration time in simulated intestinal fluid, was the least toxic of several formulations (16). Furthermore, this formulation was found to be as effective against *T. trichiura* as the standard commercial dithiazanine, which exhibited more side reactions. Similar results on the relative effectiveness and tolerance of dithiazanine II have been reported by Evans and co-workers (14) and Hammond and McCowen (17). Although the first group of investigators demonstrated that dithiazanine II (which they designated formulation A) was also as effective against hookworm and *A. lumbricoides* as the standard commercial prep-

aration, we doubted that dithiazanine II would have the desired broad-spectrum effect against those organisms located in the upper part of the small intestine. The manufacturer, therefore, developed another formulation, dithiazanine amberlite, which was expected to be more effective against these organisms. Dithiazanine amberlite combines dithiazanine iodide and an inert resin as a means of gradually releasing the active drug throughout the small intestine.

This report presents the results of a school therapy program using dithiazanine II, dithiazanine amberlite, and placebo (A).

Materials and Methods

Through discussion with appropriate school authorities, St. Peter's Elementary School, with

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Dr. Carl C. Janowsky, director of the division of epidemiology, and Dr. Donald Cornely, chief of the section of maternal and child health, Philadelphia Department of Public Health, assisted in obtaining clearance for this study. Sister Superior Mary Edwards, principal of St. Peter's Elementary School, gave general supervision to the teachers during collection of specimens and administration of the drugs.



Left: Standard fecal smears were prepared, using an exposure meter, for microscopic examination to determine the intensity of the helminth infections. Right: Medication was placed in individual envelopes for each student.

approximately 50 percent Puerto Rican children, was selected for the therapy. At the beginning of the program, in February 1960, the total enrollment of the 8 grades was approximately 400. The number of pupils per class ranged from 25 to 70. Signed permission slips were received from the parents or guardians of 98 percent of the pupils. The remainder of the children were excluded from the program.

Parasitological Examinations

Because of the seriousness of schistosomiasis, an effort to detect infections with *Schistosoma mansoni* was incorporated into this program. Three hundred and ninety children were skin tested with an *S. mansoni* antigen, which is being evaluated by the Communicable Disease Center of the Public Health Service (18) for the World Health Organization. Although the details of the skin test results have no bearing on this study, 60 of the children responded to the skin test antigen, 40 of them Puerto Ricans. These 60 children and 50 others from areas of Puerto Rico in which parasitic infections are endemic were selected for stool examinations.

Prior to therapy 3 stool specimens were requested from the 110 pupils during a 3-week period. For children demonstrated to be infected with one or more species of nematodes (*T. trichiura*, *A. lumbricoides*, hookworm, and *S. stercoralis*) two stool specimens were examined at 1 month and at 2 months after therapy.

The same laboratory regimen was used throughout. Collection cartons were distrib-

uted by the teachers. The desired dates of the specimens and information identifying the pupils were written on the cartons. The specimens were delivered to the parasitosis clinic by the pupils, usually on their way to school (about 8 a.m.). As soon as possible, a portion of each specimen was preserved in a jar containing 10 percent formalin.

Each preserved specimen was examined for eggs by the formalin ether concentration technique (19). Egg counts were made on those specimens revealing intestinal nematodes, using the standard smear technique of Beaver (20). When eggs were not observed in standard smears prepared from specimens which were positive by concentration, the egg counts were recorded as being less than 500 eggs per gram. In appraising the effectiveness of therapy the average number of eggs per gram of feces in the four post-treatment specimens was compared with the average number in the three pretreatment specimens. No attempt was made to quantitate counts of less than 500; however, in determining the average number of eggs "less than 500 eggs per gram" was counted as 250. Although identified protozoa were recorded, no special attention was given to the study of these organisms.

Therapy

The dithiazanine II (D II) was in the form of enteric-coated tablets consisting of a cellulose phthalate coat and a core of dithiazanine iodide and methylcellulose. The ovoid blue



Left: Medication was administered by the teacher in rear of the room while students worked on their class assignments. Right: Liquid medication was given to children who were unable to swallow the capsules or tablets.

tablets were available in 50 and 100 mg. sizes. The dithiazanine amberlite (D amb) consisted of dithiazanine iodide combined with a resin (a copolymer of styrene and divinylbenzene) and was available in 50 and 100 mg. capsules. The placebo consisted of tablets and capsules resembling the dithiazanine formulations but containing wheat flour in the place of the active ingredient.

Since the non-Puerto Rican school children in Philadelphia have been shown by Weiner and co-workers (1) to be rarely infected with nematodes (with the possible exception of *E. vermicularis*), there was little need to give medication to this segment of the school population. However, in order not to appear to discriminate by selecting the Puerto Rican children for therapy, a placebo was given to all the non-Puerto Rican and the uninfected Puerto Rican children. The two dithiazanine formulations were assigned randomly to the unexamined Puerto Rican children and to those known to harbor intestinal nematodes.

The same 10-day course of therapy was used for each dithiazanine product. The total daily dose was adjusted to the weights of the children as follows: 20-29 lb., 200 mg.; 30-39 lb., 300 mg.; 40-49 lb., 400 mg.; 50-59 lb., 500 mg.; 60 lb. and over, 600 mg. The placebo was administered at a similar rate for the 10-day period. The required number of tablets or capsules of the assigned drug for each child was placed in an envelope labeled with the child's name, weight, class, medication code, and dose.

The daily dose for each person was divided and one-half given at 9 a.m. and the other at 1 p.m. The medications were administered on the school days of two consecutive weeks. The 10 days of therapy were therefore interrupted by the 2-day weekend.

The medications were administered in the classrooms by the teachers with the assistance of business school students who recorded on an appropriate chart the number of capsules or tablets swallowed. A Spanish-speaking physician was present during each therapy period in order to handle any problems of administration or reactions. Children who were unable to swallow the assigned tablets or capsules were given the drug or the placebo in a teaspoon of water. Since only about a dozen were given the suspensions, a separate analysis comparing that method of administration with the capsules and tablets could not be made.

The teachers were asked to record by date all side reactions observed or reported to them. In addition, three times each week they specifically asked all the children receiving D II and D amb and the uninfected children receiving the placebo a set of standard questions concerning the occurrence of reactions. An attempt was made to phrase the questions so as not to induce psychosomatic reactions. Specific attention was given to reports of vomiting, nausea, abdominal pain, diarrhea, and blue urine. Reports of blue urine were immediately investigated by the physician, but he found all of them to be erroneous, primarily the result of language difficulties.

The teachers were instructed to refer to the physician unusual side effects, persistent symptoms, refusal to continue medication, or any emergency. If a pupil was absent from school, the cause was determined and recorded. If reactions occurred over the weekend, the students were instructed to call the principal, who would refer the patient to a local hospital where a medical member of the staff was alerted to attend to any situation that would arise; no such cases developed.

Results

Parasites Found

Of the 110 children selected for examination, 107 submitted three stool specimens each during the 3-week period prior to therapy. The remaining three withdrew from the program because they left the school.

Of the 107 children, 87 were Puerto Ricans. Fifty-nine (68 percent) were infected with one or more helminths (table 1). *T. trichiura* and hookworm were the most prevalent. Although no special effort was made to find and identify protozoa, 49 (56 percent) were found to harbor these organisms. Only one infection of *Entamoeba histolytica* was observed.

Table 1. Parasitological results of pretreatment examination of 3 stool specimens each from 87 Puerto Rican children in a school anthelmintic program

Organism	Number of children positive	Percent positive
Helminths	59	68
<i>Trichuris trichiura</i>	52	60
Hookworm	23	26
<i>Ascaris lumbricoides</i>	1	1
<i>Strongyloides stercoralis</i>	3	3
<i>Enterobius vermicularis</i>	2	2
<i>Schistosoma mansoni</i>	5	6
Protozoa	49	56
<i>Entamoeba histolytica</i>	1	1
<i>Entamoeba hartmanni</i>	1	1
<i>Entamoeba coli</i>	24	28
<i>Endolimax nana</i>	23	26
<i>Iodamoeba buetschlii</i>	1	1
<i>Giardia lamblia</i>	18	21
Total, helminths and/or protozoa	74	85

No helminths were found in the 20 non-Puerto Rican children although 7 (35 percent) harbored protozoa (none with *E. histolytica*, 2 with *Entamoeba coli*, 2 with *Endolimax nana*, 2 with *Giardia lamblia*, and 1 with both *E. coli* and *E. nana*).

Side Reactions to Therapy

The following numbers of children received the three medications from March 21 through April 1:

	Number of children
Dithiazanine II	64
Puerto Ricans infected with nematodes	28
Unexamined Puerto Ricans	36
Dithiazanine amberlite	64
Puerto Ricans infected with nematodes	29
Unexamined Puerto Ricans	35
Placebo	262
Examined but no nematodes found (27 Puerto Ricans)	47
Unexamined non-Puerto Ricans	215

During the 10 days of therapy and the intervening weekend, the prevalence of side reactions was approximately the same for children on D II (56 percent) and those on D amb (50 percent), as shown in table 2. Also, there was essentially no difference in prevalence of side reactions during the first 5 days, but from the 6th through the 12th day 44 percent of the children on D II and only 25 percent of those on D amb had reactions. The difference between these percentages is significant at the 5 percent probability level with $X^2=4.19$. More than one-fourth of those on the placebo reported reactions, with the greatest proportion occurring during the first 5 days. From 20 to 30 percent of those reacting to the three medications, reacted on either the first or second days.

Nausea, vomiting, and abdominal pain were the most common reactions to both of the dithiazanine formulations (table 3). Nausea and vomiting were more frequent with D II than with D amb; however, the differences are not statistically significant. For two children on D II, medication was stopped after 9 days of therapy because of persistent vomiting. Twenty-three percent of those receiving the placebo complained of nausea. Of the children having reactions, 46 percent had them only on

1 day and 69 percent experienced only one type of complaint.

Effectiveness of Therapy

Of the 57 infected Puerto Rican children who received the dithiazanine formulations, 53 submitted 4 post-treatment stool specimens.

Forty-five of these 53 children were infected with *T. trichiura*. Seventeen (85 percent) of the 20 treated with D II were apparently "cured" (no eggs demonstrated), as compared with only 11 of the 25 (44 percent) who received D amb (table 4). This difference is significant at the 5 percent probability level with $X^2=6.3$. Also, the percentage reduction in the average egg count was greater in those receiving D II (97 percent versus 75 percent). However, the distribution of percentage reductions by individuals exhibited modes between 90 percent and 100 percent for both drugs. D II appeared to be more consistent in reducing egg counts since

four children on D amb had no reduction. The nature of these distributions was such that a statistical test for significance is not justified.

Twenty of the children submitting four post-treatment specimens were infected with hookworm. Although neither of the two dithiazanine formulations was very successful against hookworm, D II was somewhat more effective than D amb (table 5). Two of the 10 (20 percent) on D II and 1 of the 10 on D amb were apparently cured. Average egg counts were reduced 49 percent for D II and 13 percent for D amb. These differences are not large enough to be statistically significant in a sample of this size.

Two of the 53 children were infected with *S. stercoralis*. This organism was not seen in any of the post-therapy specimens from these two children. One of these children was treated with D II and the other with D amb. The one child infected with *A. lumbricoides* received

Table 2. Prevalence of side reactions in children receiving dithiazanine or placebo in a school anthelmintic program

Therapy	1st-5th day			6th-12th day ¹			Total period		
	Number on drug	Number reacting	Percent reacting	Number on drug	Number reacting	Percent reacting	Number on drug	Number reacting	Percent reacting
Dithiazanine II (tablets) . . .	64	23	36	² 61	27	44	64	36	56
Dithiazanine amberlite (capsules)	64	25	39	64	16	25	64	32	50
Placebo	47	11	23	³ 46	3	7	47	13	28

¹ No therapy on 6th and 7th days.

² 3 dropped from study during 1st week.

³ 1 dropped from study during 1st week.

Table 3. Types of side reactions in children receiving dithiazanine or placebo during 12-day school anthelmintic program

Therapy	Number on drug	Nausea		Vomiting		Abdominal pain		Other reactions		Multiple reactions		Therapy discontinued because of reactions	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Dithiazanine II (tablets)	64	30	47	23	36	17	27	2	3	8	13	2	3
Dithiazanine amberlite (capsules)	64	26	41	16	25	17	27	4	6	13	20	0	0
Placebo	47	11	23	2	4	3	6	3	6	3	6	0	0

D II. Although the infection was not eliminated, the post-therapy examination revealed a 75 percent reduction in the egg count.

Discussion

Each phase of the therapy program was completed on schedule with a minimum of difficulty, thanks to the interest and cooperation of the teachers and the orderly behavior of the pupils. Of the various phases of the program, the 10-day therapy period required the greatest attention on the part of the teachers. However, after the teacher had developed a system for administering the medications, all the students in a class could usually be treated within 15 to 20 minutes. In a number of classes lessons continued during these periods. After the first day, any child known to have difficulty swallowing the assigned medication was sent to a physician in the school's clinic for special handling. This arrangement made it possible for the drug administration in the classrooms to be handled in a routine manner.

Although the prevalence of side reactions was rather high, it should be realized that a special effort was made to record all symptoms conceivably referable to the medications. Reactions were recorded five times more frequently

with D II in the school children than in the outpatients of the parasitosis clinic (16). Whereas 36 percent of the children had reactions during the first 5 days, only 7 percent of the outpatients reported reactions during a 5-day course of therapy. Similarly, children on placebo had six times as many reactions as were reported by the outpatients on placebo. Group psychology probably played a role in the occurrence of complaints in the school children. Although the placebo capsules contained only flour, approximately one-fourth of those receiving them reported the subjective feeling of nausea. Only 2 of the 47 on the placebo actually vomited. Except in two instances when therapy (D II) was discontinued because of vomiting, the occurrence of side reactions did not interfere with the program or constitute a problem. In most instances, a given child experienced only one type of complaint, and approximately one-half of those children with reactions had them only on 1 day.

Regardless of the therapy received, approximately 25 percent of the children with reactions had them only on the first and second days. Possibly these reactions were due to the excitement of the new activity and the inexperience of those giving the medication. In addition, the longer course of therapy (10 rather than 5

Table 4. Effectiveness of dithiazanine against *Trichuris trichiura* in a school anthelmintic program

Therapy	Number infected	Cured ¹		Average egg count		
		Number	Percent	Pretreatment	Post-treatment	Percent reduction
Dithiazanine II (tablets)-----	20	17	85	2, 470	70	97
Dithiazanine amberlite (capsules)-----	25	11	44	3, 670	930	75

¹ No eggs demonstrated in post-therapy specimens.

Table 5. Effectiveness of dithiazanine against hookworms in a school anthelmintic program

Therapy	Number infected	Cured ¹		Average egg count		
		Number	Percent	Pretreatment	Post-treatment	Percent reduction
Dithiazanine II (tablets)-----	10	2	20	1, 260	640	49
Dithiazanine amberlite (capsules)-----	10	1	10	1, 700	1, 480	13

¹ No eggs demonstrated in post-therapy specimens.

days) contributed to the high rate of side reactions. The number of children receiving dithiazanine who reported reactions increased by 42 percent (from 48 children to 68 children) during the second week of medication.

Since it was believed that D amb would release the active ingredient progressively along the length of the small intestine it was anticipated that it would be more effective than D II, particularly against hookworm which is located in the upper parts of the intestinal tract. Although in this study D amb (in capsules) was less toxic than D II, its anthelmintic properties were not as great as D II against *T. trichiura* and hookworm. Possibly the anthelmintic action of both dithiazanine products would have been greater if medication had been given over a longer period of the day. One-third of the daily dose could perhaps have been given to each child to be taken at home, but we considered it preferable to halve the daily dose so that the prescribed amount could be given under supervision at school.

The effectiveness of D II against *T. trichiura* in this study compares favorably with the best results reported by others using the commercial product (3,4,8,9,11,12,14,15,21). In our previous work with outpatients at the parasitosis clinic (16), D II and the commercial product were equally effective, but their effectiveness was less than that reported by other investigators. The greater effectiveness of D II in the school program was probably due to two factors: the assurance that the children received the prescribed medication and the longer course of therapy. Although a 10-day course of therapy has been shown by others to increase the effectiveness of dithiazanine to some degree (4), we believe that the greater effectiveness in this study as compared with the treatment of clinic outpatients is more likely due to the certainty that the medication was received.

The number of hookworm patients treated with D II in the present study is perhaps too small for strict comparison with the findings of others regarding the commercial product (4,7,8,9,11,12,15). The effectiveness of D II observed in our study, however, appears to be comparable to or less than that reported by others with the commercial product. In a comparative study of 17 hookworm patients, Evans

and co-workers (14) reported that D II and the commercial product produced similar results in reducing egg counts (approximately 95 percent reduction).

Spontaneous loss of worms is known to occur in persons who no longer reside in endemic areas. In a survey of elementary school children in Philadelphia (1), it was observed that the prevalence of hookworm was reduced by approximately 50 percent after residence in the city from 4 to 6 years, and to zero after 6 years. The prevalence of *T. trichiura* persisted at a fairly constant level for 6 years but afterward decreased by approximately 50 percent. Complete information on length of residence in the United States was not available on all the school children in the present study. However, two of the children who had not visited Puerto Rico for 7 years still harbored hookworm infections.

Since worms often disappear without therapy, it would have been desirable in evaluating the anthelmintic effects of the drugs to have had groups of infected children on the placebo. However, this was not practical in this program since it was considered desirable to treat all children known to be infected. In the treatment of outpatients at the parasitosis clinic (16), placebos were given to persons infected with *T. trichiura*. Over a 4-month post-treatment period 10 percent were "cured," and a 34 percent reduction was noted in the egg counts. D II, on the other hand, apparently eradicated the infection in five times as many of the outpatients and resulted in more than twice the reduction in worm burden. Although these comparisons between the placebo and the dithiazanine products in outpatients might be considered in determining the "true" effectiveness of the therapy used in the school program, they would not influence the conclusions regarding the relative effectiveness of the two formulations.

Although successful mass therapy without significant side reactions has been reported with the commercial tablets of dithiazanine (11,15), Ding and Sutlive (13) concluded from their study in Sarawak, Borneo, that "because of its lack of activity against hookworm and the large number of patients with reactions of nausea or vomiting, or both, dithiazanine ap-

pears to be unsuitable for mass therapy treatment of patients in this area." From the results of the present study and of previous work (14,16,17), D II appears to be a better formulation of dithiazanine for use in mass therapy. It is much less toxic than the commercial product and to date appears to be as effective against *T. trichiura*, *A. lumbricoides*, and *E. vermicularis*. Effectiveness against hookworm has not been convincingly demonstrated, and with exception of the one case in this study no reports have appeared on the treatment of *S. stercoralis* infections with D II. However, in view of the increase in side reactions which developed during the second week of therapy in the present study, administration of D II should perhaps be restricted to the standard 5-day course (14,17). D amberlite as used in this study does not appear to constitute an improvement. Its lower toxicity and reduced effectiveness may indicate that the active ingredient is not being completely released in the intestines.

It is questionable whether mass therapy is necessary against nematode infections harbored by Puerto Rican children in this country. Information gathered to date indicates that most infections are light and many will be lost spontaneously. Although symptomatology referable to helminth infections is frequently related to the nutritional status of the host, it is generally agreed that 100-200 adult hookworms (2,600-5,000 eggs per gram) and 200 adult *T. trichiura* (25,000-30,000 eggs per gram) are necessary to produce symptoms in the host (22, 23). Only 8 percent of the school children in this study infected with *Trichuris* and 25 percent infected with hookworm had parasite counts at these significant levels on at least one of their three pretreatment examinations. On this basis it can be estimated that approximately 11 percent of the Puerto Rican children in the school had clinically significant infections of nematodes. The status of pinworm infections in the school was not determined by the procedures employed. In an endemic area one of the objectives of mass therapy is to eradicate the infections and thus help to interrupt transmission. In the northern United States, the objective of anthelmintic therapy can possibly be limited to reducing the intensity of

helminth infections to insignificance for the benefit of the individual.

If an inexpensive, highly effective, nontoxic drug that could be easily administered at school were available, it might well be argued that mass therapy would be appropriate, even though only 8 percent of the Puerto Rican children have clinically significant nematode infections. Unfortunately, such an ideal drug has not yet been developed. Therefore, although the examination of stool specimens is expensive and laborious, it might be better to seek out and treat the heavy infections rather than bear the expense of administering an anthelmintic to many children who may not particularly profit from the medication. The teachers in this country should be made aware of the possibility that parasitic infections may be responsible in some instances for the ill health and slower development of Puerto Rican children in their classes. They should be encouraged and given necessary assistance to have these children properly examined for parasites.

Summary

Pretreatment stool examinations indicated that 68 percent of the Puerto Rican children in a Philadelphia elementary school harbored helminths, principally *Trichuris trichiura*.

A 10-day therapy program was instituted using two formulations of the broad-spectrum anthelmintic, dithiazanine, to treat 128 infected or unexamined Puerto Rican children. A placebo was given to 262 uninfected Puerto Ricans and uninfected or unexamined non-Puerto Rican children.

In determining relative effectiveness of the two formulations, results of three pretreatment and four post-treatment stool examinations were analyzed for 45 children infected with *T. trichiura* and 20 infected with hookworm. Dithiazanine II (tablets) was significantly more effective than dithiazanine amberlite (capsules) against *T. trichiura* (85 percent versus 44 percent cured; 97 percent versus 75 percent, reduction in egg counts). Although dithiazanine II also appeared to be more effective against hookworm, the differences were not statistically significant.

During the first 5 days of therapy, 36 percent

of the children on dithiazanine II, 39 percent on dithiazanine amberlite and 23 percent on the placebo had side reactions. The relative intolerance to dithiazanine II increased during the second 5 days of therapy. With the exception of excessive vomiting by two children who were removed from therapy with dithiazanine II on the 9th day, the side effects did not constitute a serious problem.

Dithiazanine II has promise as a suitable drug for mass therapy against nematode infections, since it appears to be more effective and better tolerated than the commercial dithiazanine product. However, since most children have light infections and many lose the worms spontaneously, over a period of years, it is questionable whether mass therapy against nematode infections harbored by Puerto Rican children is necessary in schools located in the northern United States, which is outside the recognized endemic areas for these parasites.

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SUPPLY REFERENCE

- (A) Eli Lilly and Co., Indianapolis 6, Ind.

Program Notes

Severe aspirin poisoning in seven children was successfully counteracted by intermittent lavage of the peritoneal cavity with a 5 percent albumin solution in clinical trials reported by Dr. J. N. Ettledorf and co-authors in the *Journal of Pediatrics*. A Public Health Service grant supported the studies.

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How private physicians can help halt the rise in venereal disease, particularly in obtaining and reporting information about contacts, is discussed by Dr. L. L. Heimoff of New York Hospital's syphilis clinic in *Medical World News* (June 9, 1961).

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An extensive, year-long study of air pollution in Philadelphia has been undertaken by the city health department and the Public Health Service. Nine air sampling machines will be used to record amounts of pollutants in various parts of the city, 24 hours a day.

Previously gathered data show a 30 percent decline in air pollution in Philadelphia on weekends compared with weekdays. The ratio of lead to total dirt in samples obtained from the new sampling stations may enable investigators to determine the extent to which reduced city traffic is responsible for the weekend decline.

Los Angeles and Cincinnati are conducting similar studies.

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The 1961 "Bibliography of Medical Reviews," prepared by the National Library of Medicine, will be a cumulative issue, containing all material published in BMR since the beginning of the series in 1955, in addition to new material for 1960. Copies will be available in late 1961.

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The 30th anniversary report of the Cortland County, N.Y., health department includes an extensive review of the history of public health services in the county.

A short-term intensive training program for accident prevention specialists is being developed at New York University under a contract with the Division of Accident Prevention, Public Health Service.

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Twenty-four cases of rabies in foxes, cattle, cats, skunks, and raccoons but none in dogs were reported in the first quarter of 1961 for New York State, exclusive of New York City.

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About 28,000 engineers, 12,500 scientists, and 47,000 technicians were employed by State governments as of January 1959, according to a National Science Foundation report. These were more than 10 percent of the total personnel in State agencies.

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Brown University officials are planning a 6-year curriculum in the medical sciences. Graduates of the program will be prepared to go into a medical school as third-year students, or into teaching or research in the medical sciences by completing 2 additional years of study for a Ph.D. degree.

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Transcripts of a recent discussion by physicians and scientists on "The Aging Patient" are available from the Information Officer, Center for Aging Research, National Institutes of Health, Bethesda 14, Md.

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Since 1958, the venereal disease educational assistance program of Ohio's Departments of Health and Education has provided more than 1,000 teachers with training in incorporating venereal disease education into school curriculums. The program is supported by a grant from the Public Health Service. More than 60,000 copies of a pamphlet on venereal disease, "Strictly for Teenagers," have been distributed.

The Highway Research Board is sponsoring a study to appraise the registration and titling system in the States and thus permit improvement in the control of vehicles and drivers, according to *Automotive Safety*, a quarterly publication of the Automobile Manufacturers Association, Detroit.

Registration and titling aid in identifying vehicles and their owners in the event of an accident or law violation and are instrumental in the collection of privilege taxes for street and highway use.

Many States use part of the fees collected to finance traffic safety improvement measures.

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Dr. Ludwik Gross of the Bronx, N.Y., Veterans Administration Hospital and Sloan-Kettering Institute, states in his new book, "Oncogenic Viruses," that it is now apparent that most malignant tumors of chickens and of mice are caused by viruses. It is possible, perhaps probable, that malignant tumors in humans also are caused by viruses, he says.

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One of every two alcoholics has had an alcoholic parent, says Dr. Marvin A. Block, chairman of the American Medical Association's committee on alcoholism. He states that alcoholism is a "communicable" disease and is not hereditary.

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An antirabies program to reduce the fox population has been planned by the New York State Conservation Department. An estrogen hormone in chunks of meat, placed along wild fox runs, will reduce mating among foxes and eliminate new potential rabies carriers.

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The Allegheny County Board of Health, Pittsburgh, Pa., has received a recommendation from Herbert R. Domke, director, and Herbert J. Dunsmore, chief of the bureau of air pollution, Allegheny County Health Department, to provide a definite schedule for the installation of dust collection equipment to control major sources of air pollution from the steel industry.